

इंटरनेट

मानक

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Mazdoor Kisan Shakti Sangathan

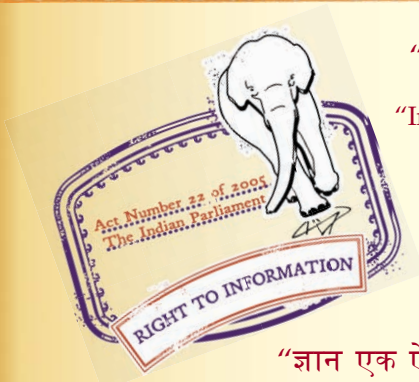
“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 7454 (1991): Rehabilitation equipment - Wheelchairs, folding, adult size [MHD 10: Medical Laboratory Instruments]



“ज्ञान से एक नये भारत का निर्माण”

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“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

पुनर्स्थापन उपस्कर — पहिए वाली कुर्सियां, फोल्डिंग,
व्यस्क साईज — विशिष्ट

(पहला पुनरीक्षण)

Indian Standard

REHABILITATION EQUIPMENT —
WHEELCHAIRS, FOLDING, ADULT SIZE —
SPECIFICATION

(*First Revision*)

UDC 684.432 : 615.478.3

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BHADUR SHAH ZAFAR MARG
NEW DELHI 110002

**Artificial Limbs, Rehabilitation Appliances and Equipment
for the Disabled Sectional Committee, MHD 10**

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Artificial Limbs, Rehabilitation Appliances and Equipment for the Disabled Sectional Committee had been approved by the Medical Equipment and Hospital Planning Division Council.

The wheelchair is basically used for transportation of patients with varying physical impairment. To meet the requirement of different categories of patients, different features are required to be provided in the wheelchair. These features are as given below:

- a) *Armrest* 1) Fixed
 2) Detachable
- b) *Legrest* 1) Fixed
 2) Swinging and detachable
 3) Swinging, detachable and elevating
- c) *Footrest* 1) Swinging without height adjustment
 2) Swinging with height adjustment

The various combinations of above features will make a totally different wheelchair suitable for a particular category of patients. Thereby, a large number of models can be obtained.

The purchaser should, therefore, mention the model with combination of these features/facilities. However, if not mentioned, the basic model shall be a(1), b(1) and c(1).

This standard was first published in 1974. The significant changes in this revision ensure that the chair is built in such a manner as to adopt various commonly used accessories. This standard permits the use of high strength, low weight steel tubing, shouldering action and an inclined seat.

The requirements of stability test are under consideration and will be included when they are finalized.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (revised)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

AMENDMENT NO. 5 APRIL 2012
TO
IS 7454 : 1991 REHABILITATION EQUIPMENT —
WHEELCHAIRS, FOLDING, ADULT SIZE —
SPECIFICATION

(First Revision)

[Page 3, clause **6.3.2** (see also Amendment No. 4)] — Add the following after the existing clause:

‘A suitable polyester fabric shall be used for covering the seat and back rest. The fabric should be non-toxic, non-allergic.’

(Page 3, clause **6.5**, first sentence) — Substitute the following for the existing sentence:

‘The footrests may be of die cast aluminium with corrugated surface or of plastic with corrugated surface or of tubular structure not less than 125 mm across the feet, as desired by the purchaser.’

(Page 3, clause **6.6**) — Add the following matter after the existing clause:

“The solid tyres used in castors shall be made of Ethylene Vinyl Acetate (EVA) with a minimum hardness of 60 Shore ‘A’ with smooth treads.”

(Page 3, clause **6.7.1**) — Add the following matter after the existing clause:

‘Solid tyres shall be made from rigid PVC or Ethylene Vinyl Acetate (EVA).’

(Page 4, clause **7.3.7**, first line) — Substitute ‘50 mm’ for ‘75 mm’.

(Page 5, clause **8.2**, first sentence) — Substitute the following for the existing sentence:

‘All exposed metallic parts shall be stove enamelled (after primary coat) or powder coated or plated as agreed to between the purchaser and the supplier.’

(MHD 09)

Reprography Unit, BIS, New Delhi, India

AMENDMENT NO. 4 MAY 1995
TO
IS 7454 : 1991 REHABILITATION EQUIPMENT —
WHEELCHAIRS, FOLDING, ADULT SIZE —
SPECIFICATION

(First Revision)

(*Page 1, Table 1, thirteenth row*) — Substitute the following for the existing entry:

‘Wheel diameter 40 - 534
 (24" × 1 $\frac{1}{2}$ ")’

[*Page 3, clause 6.3.1 (see also Amendment No. 2)*] — Substitute the following for the existing clause:

‘6.3.1 The seat and backrest shall be fabricated from cotton duck of suitable variety.’

(*Page 3, clause 6.3.2*) — Substitute the following for the existing clause:

‘6.3.2 A suitable vinyl coated fabric shall be used for covering of seat and backrest.’

[*Page 3, clause 6.6 (see also Amendment No. 3)*] — Substitute the following for the existing clause:

‘‘6.6 The solid tyres used in castors shall be made of non-marking resilient rubber with a minimum hardness of 60 shore ‘A’ with smooth treads.’’

(*Page 3, clause 6.7.1, first sentence*) — Substitute the following for the existing sentence:

‘The rear wheels shall be of 40-534 (24" × 1 $\frac{1}{2}$ ") size and shall have rims, tyres, tubes, nipples, spokes and washers as per the standard bicycle trade.’

[*Page 4, clause 7.7.3 (see also Amendment No. 3)*] — Substitute the following for the existing clause:

‘7.7.3 The tyre shall be not less than 150 mm in diameter. The tyre shall be snap-on type and it shall not roll on the wheel rim under a load of 100 kg.’

(MHD 10)

AMENDMENT NO. 3 MARCH 1993
TO
IS 7454 : 1991 REHABILITATION EQUIPMENT —
WHEELCHAIRS, FOLDING, ADULT SIZE —
SPECIFICATION

(First Revision)

(Page 3, clause 6.6) — Substitute the following for the existing clause:

“6.6 The solid tyres used in castors shall be made of non-marking resilient rubber with a minimum hardness of 60 to 70 shore ‘A’ with smooth treads.”

(Page 3, clause 6.7.1, second sentence) — Substitute the following for the existing sentence:

“The solid tyres used in castors shall be made of non-marking resilient rubber with a minimum hardness of 60 to 70 shore ‘A’ with smooth treads.”

(Page 4, clause 7.7.1) — Substitute the following for the existing clause:

‘7.7.1 The wheelchair shall have two castors which shall be able to swivel through 360° in both directions, firmly secured to the frame in the front with either of the following combinations of bearings for smooth and silent performance:

- a) Two ball/thrust bearings, or
- b) One ball/thrust bearing and a pair of swivelling bush bearings.’

(Page 4, clause 7.7.3) — Substitute the following for the existing clause:

‘7.7.3 The tyre shall be not less than 150 mm in diameter. The tyre shall be snap-on type and it shall not roll on the wheel rim under normal loads.’

(Page 4, clause 7.8) — Substitute the following for the existing clause:

‘7.8 Wheels

The wheels shall be fixed to the frame in such a manner that the fitting shall be rugged enough to withstand the shocks during normal use. The wheels shall not rotate in more than one plane when the chair loaded with 100 kg is propelled. The wheels shall be removable from the chair without disturbing the bearing assembly.’

(MHD 10)

AMENDMENT NO. 1 JUNE 1992

AMENDMENT NO. 2 NOVEMBER 1992 TO IS 7454 : 1991 REHABILITATION EQUIPMENT — WHEELCHAIRS, FOLDING, ADULT SIZE — SPECIFICATION

(First Revision)

(Page 1, Table 1, twelfth row) — Substitute the following for the existing entry:

‘Clearance of frame from floor 90, *Min*’

(Page 3, clause 6.3.1) — Substitute ‘minimum Variety No. 2’ for ‘Variety No. 1’.

(Page 5, clause 9.4) — Add the following new clause after 9.4:

‘9.5 Stability Test

The wheelchair must resist toppling. All wheels must remain in contact with the surface of a 9° slope when the wheelchair is loaded with a 100 kg test load and positioned on the 9° slope with the front of the chair, pointed up-slope and the locks on the drive wheels engaged.’

AMENDMENT NO. 1 JUNE 1992
TO
IS 7454 : 1991 REHABILITATION EQUIPMENT —
WHEELCHAIRS, FOLDING, ADULT SIZE —
SPECIFICATION

(First Revision)

(Page 1, clause 4.1) — Substitute the following new matter for the existing matter:

<i>New matter</i>	<i>Existing matter</i>
<i>Type 1</i>	<i>Type 0</i>
<i>Type 2</i>	<i>Type 1</i>
<i>Type 3</i>	<i>Type 2</i>
<i>Type 4</i>	<i>Type 3</i>
<i>Type 5</i>	<i>Type 4</i>
<i>Type 6</i>	<i>Type 5</i>
<i>Type 7</i>	<i>Type 6</i>
<i>Type 8</i>	<i>Type 7</i>
<i>Type 9</i>	<i>Type 8</i>
<i>Type 0</i>	<i>Type 9</i>

(MHD 10)

Indian Standard

REHABILITATION EQUIPMENT — WHEELCHAIRS, FOLDING, ADULT SIZE — SPECIFICATION

(First Revision)

1 SCOPE

1.1 This standard specifies the requirements for adult size, folding wheelchairs used by invalids.

1.2 This standard covers only the requirements of Type 1 and Type 2 wheelchairs (see 4.1). Types 3, 4, 5, 6, 7, 8, 9 and Type 0 wheelchairs (see 4.1) are not covered in this standard.

2 REFERENCES

2.1 The following Indian Standards are necessary adjuncts to this standard:

IS No.	Title
1068 : 1985	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium on iron and steel (<i>second revision</i>)
1422 : 1983	Cotton duck (<i>third revision</i>)
1586 : 1968	Method for Rockwell hardness test for metallic materials (Scales A-B-C-D-E-F-G-H-K) (<i>second revision</i>)
1868 : 1982	Anodic coatings on aluminium and its alloys (<i>second revision</i>)
4827 : 1983	Electroplated coatings of nickel and chromium on copper and copper alloys (<i>first revision</i>)
5192 : 1975	Vulcanized natural rubber compounds (<i>first revision</i>)
8698 : 1984	Expanded vinyl coated fabrics (<i>first revision</i>)

3 TERMINOLOGY

3.1 The terminology for the wheelchairs is indicated in Fig 1.

4 TYPES

4.1 The type classification of the wheelchairs according to the means of propulsion/steering

shall be as follows:

- Type 0* Attendant controlled—non-powered
- Type 1* Non-powered direct drive on rear wheels, bimanual
- Type 2* Non-powered direct drive on front wheels, bimanual
- Type 3* Non-powered lever drive, bimanual
- Type 4* Non-powered single-sided drive
- Type 5* Non-powered foot propulsion
- Type 6* Attendant controlled—powered
- Type 7* Electromotor for drive, manual steering
- Type 8* Electromotor for drive, power steering
- Type 9* Others

5 SHAPE AND DIMENSIONS

5.1 The typical shape of wheelchair is shown in Fig. 1. The overall dimensions shall be as given in Table 1.

Table 1 Overall Dimensions of Wheelchairs

Dimension	Size, mm
Overall length	1 000-1 100
Overall width, open	650-720
Overall width, folded	300-330
Overall height	910-950
Seat height from floor at the front	480-510
Slope of the seat	1-3°
Slope of backrest with respect to floor	5-7°
Distance between seat and footrest	400-450
Armrest height from seat	220-230
Seat depth	420-440
Clearance of footrest from floor	90-200
Clearance of frame from floor	100±10
Wheel diameter	609·6×38·1 (24"×1½")
Weight of the wheel chair (basic model)	25 kg, Max

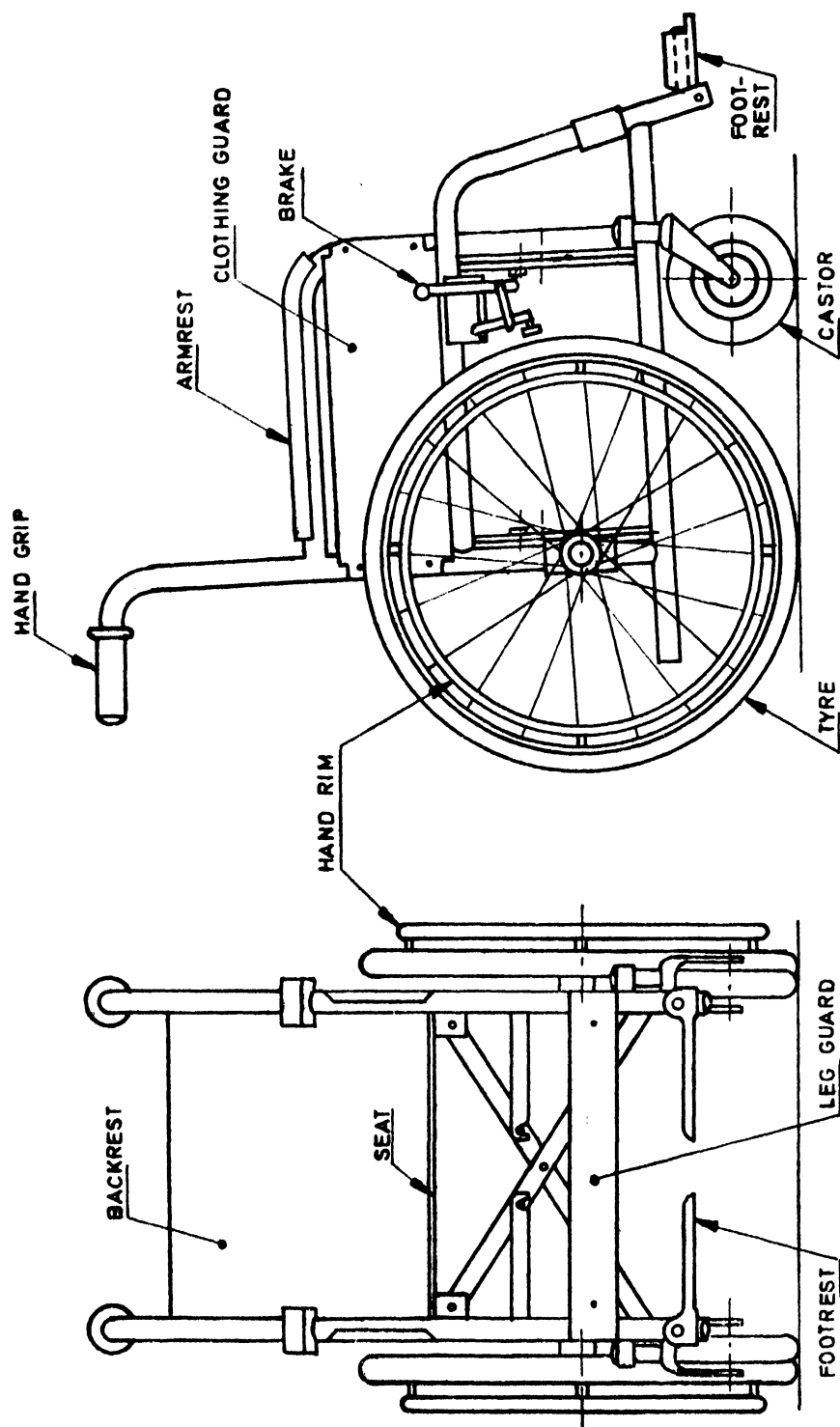


FIG. 1 WHEELCHAIR, FOLDING, ADULT SIZE

6 MATERIALS

6.0 General

The following materials shall be used in the manufacture of wheelchairs. Alternate materials which are equivalent in performance may also be used.

6.1 Frame

The frame shall be made of tubing of ERW/CEW quality conforming to the relevant Indian Standard.

6.2 Clothing Guards

The clothing guards shall be of aluminium alloy or mild steel sheets, each of thickness 1.00 mm, *Min* conforming to the relevant Indian Standards. Alternatively, suitable grade of rigid plastic of minimum 3 mm thickness may be used.

6.3 Seat and Backrest

6.3.1 The seat and backrest shall be fabricated from cotton duck conforming to Variety No. 1 of IS 1422 : 1983.

6.3.2 The fabric used for covering of seat and backrest shall be vinyl coated fabric, Grade 2, Type B of IS 8698 : 1984 or equivalent.

6.4 Armrests

6.4.1 The armrests shall be of timber (seasoned heartwood) with foam padding or integral polyurethane with foam insert. The quality and treatment of timber shall be in accordance with the relevant Indian Standards.

6.5 Footrests

The footrests may be of die cast aluminium with corrugated surfaces or tubular structure not less than 125 mm across the feet, as desired by the purchaser. If specifically required for paraplegics, footrest may be supplied to suit the length of the foot of the patient ensuring that the foot does not project out.

6.6 Castors

The tyres used in castors shall be made from non-marking quality rubber conforming to Type B, Grade 5 of IS 5192 : 1975.

6.7 Rear Wheels

6.7.1 The rear wheels shall be of 609.6 mm × 38.1 mm (24" × 1½") size and shall have rims, tyres, tubes, nipples, spokes and washers conforming to the respective Indian Standards.

Solid tyres made from non-marking quality rubber conforming to Type B, Grade 5 of IS 5192 : 1975 could also be used as an alternate to pneumatic tyres and tubes.

NOTE — In Type 1 wheelchairs, the rear wheels could be as small as the front wheels.

6.7.2 The wheels shall be firmly secured to the frame with the help of low carbon steel axles of minimum 12 mm diameter, heat treated to 30 HRC, *Min*. The hardness shall be tested in accordance with IS 1586 : 1968.

6.7.3 The hub shall have two cups/cones or ball bearings for smooth and silent operation.

6.8 Hand Rims

6.8.1 The hand rims shall be fabricated from steel/aluminium tubing with outside diameter 17 mm.

NOTE — Hand rims are not required for Type 1 wheelchairs.

6.9 Folding Mechanism

The folding mechanism shall be of suitable tubular or mild steel flat structure.

7 REQUIREMENTS

7.1 Backrest and Seat

7.1.1 The backrest shall be firmly secured to the vertical side members and shall be removable. The seat shall be firmly secured to each side of the frame. The backrest shall start 10 mm above the seat top.

7.1.2 The construction of the seat and the backrest shall be of non-rigid type and such that the cotton duck takes the load instead of the cover. The attachment shall be at a minimum of five places through the steel strip inserts.

7.2 Frame

The wheelchair frame shall be of welded construction. The various members by themselves shall each be of single piece without any joint. The rear vertical members shall be bent and sealed at the top to accommodate plastic hand grips for pushing the chair by an attendant. All open ends of tubular construction must be sealed with end plugs (metallic or plastic).

7.3 Footrests and Supports

7.3.1 The surface of the footrest shall be non-slip.

7.3.2 The footrest shall be capable of swinging about its own axis so that when a patient enters or leaves the chair, the footrest shall clear the way without causing any obstruction. In this raised position, the footrest shall be at an angle of 90° to 120° to its normal horizontal position.

7.3.3 The footrest swing shall be controlled with a spring and it shall stay in the raised position.

7.3.4 The swinging detachable type of footrest shall be free from sticking of the pin in the spring lock.

7.3.5 The footrest shall be detachable by the user himself but shall be incapable of coming out inadvertently.

7.3.6 In case of adjustable footrest, the distance between the footrest and the seat shall be capable of adjustment (namely, telescopic adjustment) through not less than 100 mm in minimum four steps. The locking mechanism for each step shall be such that once locked, it will not permit the footrest being pushed down under the weight of the patient.

7.3.7 A belt of minimum 75 mm width shall be provided at legrest level to restrict the leg from falling backward while in use. It shall be firmly secured to the wheelchair such that the fastening does not fail with the weight of the legs.

7.3.8 The footrest supports shall be of robust construction and shall be capable of swinging clear of the entrance passage of the patient.

7.4 Armrests

Armrest shall be fitted to each side of the chair and shall be of such a height and shape as to provide adequate security and prevent the patient from falling sideways out of the chair. In case of detachable armrest, it shall be detachable by the user himself but shall be incapable of coming out inadvertently. The fitting of the armrest to the frame shall be rigid and non-shaky to avoid any accident.

7.5 Hand Rims

The ends of the tubings shall be joined by welding. The fixation of hand rim to wheel rim (minimum four places) shall be such that it does not obstruct/injure the fingers while driving. The surface of hand rims shall be smooth in all respects.

7.6 Brakes

Two individual parking brakes (push/pull type), one on each wheel, shall be provided on wheelchairs. The brakes shall be capable of being locked in final position and shall be easy and compatible in operation. They shall not be loose to result into accidental locking in use.

7.7 Castors

7.7.1 The wheelchair shall have two swivelling castors firmly secured to the frame in the front with either of the following combination of bearings for smooth and silent performance:

- a) Two ball/thrust bearings, or
- b) One ball/thrust bearing and a pair of swivelling bush bearings.

7.7.1.1 The stem shall be of minimum 75 mm length.

7.7.2 The hub of wheel shall have either self-contained ball bearings or needle bearings or sintered bronze/brass bushes or nylon bushes.

7.7.3 The tyre shall be 175 to 200 mm in diameter with wheel tread of minimum 25 mm. The tyre shall be snap-on type.

7.7.4 The castor shall have a load rating of 50 kg, *Min.*

7.8 Wheels

The wheels shall be fixed to the frame in such a manner that the fitting shall be rugged enough to withstand the shocks during normal use. The wheels shall move freely and lightly to minimize physical exertion during driving. The wheels shall be removable from the chair without disturbing the bearing assembly.

7.9 Clothing Guards

Clothing guards shall be securely attached in between the front and the rear vertical members of the chair (see Fig. 1). The clothing guards shall have single or double hemmed/beaded edges for mild steel guards and single hemmed/beaded edges for aluminium guards to eliminate possibility of sharp projections which might catch and tear the clothing. The guards shall be sufficiently rigid and shall have a smooth surface.

7.10 Folding Mechanism

The folding mechanism shall not in any way affect the rigidity of the chair in the unfolded condition. The folding mechanism shall be

flexible enough to keep all the four wheels or ground with ± 20 mm variation under one wheel. It shall permit folding of the chair with ease and without any jamming of the various cross pieces.

7.11 Lubrication

Suitable provision shall be made to lubricate the various moving parts of the chair. The manufacturer shall provide complete information for the type of lubricant to be used and instructions for proper lubrication of the moving parts of the chair.

8 FINISH

8.1 Materials and finishes shall be non-toxic.

8.2 All exposed metallic parts shall be stove enamelled (after primary coat) or plated as agreed to between the purchaser and the supplier. The resulting finish shall be hard and shall not readily chip or flake.

8.2.1 When plated, the plating on the mild steel components shall conform to Service Grade No. 2 of IS 1068 : 1985.

8.2.2 All aluminium components shall be anodized or buffed clean in case of die casted components. The anodizing of aluminium components shall conform to Grade B or Grade D of IS 1868 : 1982.

8.3 Welding shall fully penetrate and shall be sound in every respect. It shall be finished smooth and there shall be no exposed sharp edges in the framework or other unsealed formations which may harbour dust. All exterior surfaces shall be free from defects and protrusions to avoid hurting the patient or tearing his clothing.

9 TESTS

9.1 Test for Wheeling

The chair shall be subjected to a load of 100 kg. The chair shall be wheeled around on an even floor. The chair shall move smoothly and straight without any wobbling, rocking or rattling.

9.2 Hazard Running Test

9.2.1 The effect of this test is to subject the framework of the wheelchair to simulated conditions similar to the worst conditions ever likely to be met in use.

9.2.2 A uniformly distributed test load of 100 kg shall be applied on the frame members

which normally carry the seat. Under this load, the wheelchair shall negotiate at least once in every metre of travel at 1.6 km/h, a hazard having a vertical drop of 10 mm.

9.2.3 This test of three hours uninterrupted duration shall not result in any deleterious effect on the chair, such as, failure of joints or welds, breaking or flaking of enamel, wobbling and rattling.

9.2.4 Measurements of the height above floor level of the top of the seat support members and the width between the arms, taken above the centre of the seat, shall be recorded both before and after the test. No change in dimensions shall be permitted. The change in height dimensions of the seat support members shall be adjusted to account for tyre wear resulting from the test which shall be computed from actual measurements of the wheel diameter taken before and after the test.

9.2.5 For the purpose of the above test, the chair may be mobile and mechanically pushed at points on the handle corresponding roughly to the position at which an attendant's hands would be placed while wheeling the chair. Alternatively, the chair may be anchored to a stationary pillar at these points on the handle and the wheels made to contact an oscillating platform (running on rails) or a rotating drum to which the hazards are fixed.

9.3 Load Test

A load of 100 kg shall be applied gradually at the middle of the armrest while preventing the chair from toppling over. The load shall be maintained for 5 minutes. The wheelchair shall not be damaged after the test. The test shall be repeated on the other armrest also.

9.4 Test for Folding

The wheelchair shall be folded and unfolded 250 times consecutively on a smooth floor. The chair shall open and close without undue exertion and it shall not suffer any damage during the test. The chair shall roll easily in the folded position. Prior to test, parts requiring lubrication shall be properly lubricated.

10 ATTACHMENTS AND ACCESSORIES

10.1 Various accessories are required to cater to the needs of different categories of patients. All the attachments incorporating such accessories shall be provided with the basic model and shall in no way become obstruction for its coverage under the Indian Standard. These

accessories are optional and include the following:

- a) Heel loops,
- b) Toe straps,
- c) Calf pads,
- d) Crutch holder,
- e) Desk type armrest tray,
- f) Pegs on hand rims, and
- g) Drip set attachments.

11 MARKING

11.1 Each wheelchair shall have a label suitably marked with the indication of the source of manufacture and the type of chair (*see 4.1*).

11.2 Each wheelchair shall be marked with a clearly visible sign shown in Fig. 2 to caution others on the road.

12 PACKING

12.1 Packing of adult size folding wheelchair shall be done as agreed to between the purchaser and the supplier.



FIG. 2. SIGN OF CAUTION.

Standard Mark

The use of the Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act, 1986* and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

Bureau of Indian Standards

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Amendments Issued Since Publication

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